

and to represent some probable ways for the Illustration of Ancient Writings And here I earnestly implore the Ayde of all the Learned, and the Noble Patrons of Learning, to bring into publick Light the Treasures of Libraries, before they be sacrificed to worms and putrefaction; and to examine Herodotus and Pliny, Theophrastus and Dioscorides, and all the Old Monuments, both with Candour and equal Integrity; to remark what is manifestly false, or with great reason to be suspected; to confirm what may by Parallels be confirmed; and lastly to see what yet further may be added to Pancirolus, & what may be thence discarded, and what Succedanea may be adopted. And now I come a fresh to offer what I have at hand.

## A Solution,

Given by Mr. John Collins of a Chorographical Probleme, proposed by Richard Townley Esq. who doubtless hath solved the same otherwise.

## Probleme.

The Distances of three Objects in the same Plain being given, as  $A, B, C$ ; The Angles made at a fourth Place in the same Plain as at  $S$ , are observed: The Distances from the Place of Observation to the respective Objects, are required.

The Probleme hath six Cases. See Tab. 1.

Case 1. **I**F the Station be taken *without* the Triangle made by the Objects, but in one of the sides thereof produced, as at  $S$  in the *first* figure: find the Angle  $ACB$ ; then in the Triangle  $ACS$  all the Angles and the Side  $AC$  are known, whence either or both the Distances  $SA$  or  $SC$  may be found,

Case 2.

Fig 2. Case 2. If the Station be *in* one of the Sides of the Triangle, as in the *Second* figure at *S*, then having the three sides *AC*, *CB*, *BA*, given, find the angle *CAB*; then again in the Triangle *SAB* all the Angles, and the side *AB* are known, whence may be found either *AS* or *SB*, *Geometrically*, if you make the angle *CAD* equal to the observed angle *CSB*, and draw *BS* parallel to *DA*, you determine the Point of Station *S*.

Fig. 3. Case 3. If the three Objects lie in a right Line as *ACB* (Suppose it done,) & that a Circle passeth through the Station *S*, and the two exterior Objects *A*, *B*: then is the Angle *ABD* equal to the observed angle *ASC* (by 21 of the 3d. book of *Euclid*,) as inscribing on the same Arch *AD*: And the Angle *BAD* in like manner equal to the observed Angle *CSB*: By this means the point *D* is determined. Joyn *DC*, and produce the same, then a Circle passing through the Points *A*, *B*, *D*, intersects *DC*, produced at *S*, the place of Station.

*Calculation.*

In the Triangle *ABD* all the Angles and the side *AB* are known, whence may be found the side *AD*.

Then in the Triangle *CAD*, the two Sides *CA* and *AD* are known, and their contained angle *CAD* is known; whence may be found the Angles *CDA* and *ACD*, the complement whereof to a Semicircle is the angle *SCA*: in which Triangle the Angles are now all known and the side *AC*: whence may be found either of the Distances, *SC* or *SA*.

Fig 4. Case 4. If the Station be *without* the Triangle, made by the Objects, the sum of the Angles observed is less than four right Angles. The Construction is the same as in the last Case, and the Calculation likewise; saving that you must make one Operation more, having the three Sides *AC*, *CB*, *BA*, thereby find the angle *CAB*, which add to the Angle *EAD*, then you have the two sides, *viz.* *AC*, being one of the Distances, and *AD*, (found as in the former Case) with their contained

Angle  $CAD$  given to find the angles  $CDA$  and  $ACD$ , the Complement whereof to a Semicircle is the angle  $SCA$ : Now in the Triangle  $SCA$ , the Angle at  $C$  being found, and at  $S$  observed, and given by Supposition, the other at  $A$  is likewise known, as being the complement of the two former to a Semicircle, and the side  $AC$  given; hence the distances  $CS$  or  $AS$  may be found.

*Case 5.* If the place of Station be at some Point *within* Fig. 5. the Plain of the Triangle, made by the three Objects, the Construction and Calculation is the same as in the last, saving only that instead of the observed Angle  $ASC$ , the Angle  $ABD$  is equal to the Complement thereof to a Semicircle, to wit, it is equal to the Angle  $ASD$ ; both of them insisting on the same Arch  $AD$ : And in like manner the Angle  $BAD$  is equal to the Angle  $DSB$ , which is the Complement of the observed  $CSB$ ; and in this Case the sum of the three Angles observed, is equal to four right Angles.

In these three latter *Cases* no use is made of the Angle observed between the two Objects, as  $A$  and  $B$ , that are made the Base-line of the Construction; Yet the same is of ready use for finding the third distance or last side sought, as in the fourth Scheme, in the Triangle  $SAB$ , there is given the distance  $AB$ , its opposite Angle equal to the sum of the two observed Angles, and the Angle  $SAB$  attained, as in the fourth Case: Hence the third side or last distance  $SB$  may be found.

And here it may be noted, that the three Angles  $CAS$ ,  $ASB$ ,  $SCB$ , are together equal to the Angle  $ACB$ ; for, the two Angles  $CSB$  and  $CBS$  are equal to  $ECB$ , as being the Complement of  $SCB$  to two right Angles; and the like in the Triangle on the other side. *Ergo, &c.*

*Case 6.* If the three Objects be  $A, B, C$ . and the Station Fig. 6. at  $S$ , as before, it may happen, according to the former Constructions, that the Points  $C$  and  $D$  may fall close together; and so a right Line, joyning them, shall be produced with uncertainty; in such case the Circle may be conceived

To pass through the place of Station at  $S$ , and any two of the Objects (as in the sixth *Scheme*) through  $B$  and  $C$ , wherein making the Angle  $DBC$  equal to the observed Angle  $ASC$ , and  $BCD$  equal to the Complement to  $180$  degrees of both the observed Angles in  $DSB$ ; thereby the point  $D$  is determined, through which, and the points  $C$ ,  $B$ , the Circle is to be described, and joyning  $DA$ , (produced, when need requireth,) where it intersects the Circle, as at  $S$ , is the place of Station sought.

This *Probleme* may be of good Use for the due Scituation of Sands or Rocks, that are within sight of three Places upon Land, whose distances are well known; or for *Chorographical* Uses, &c. Especially now there is a Method of observing Angles nicely accurate by ayde of the *Telescope*; and was therefore thought fit to be now publiht, though it be a competent time since it was delivered in in writing.

#### An Accompt

*Of some Mineral Observations touching the Mines of Cornwall and Devon; wherein is described the Art of Trayning a Load; the Art and Manner of Digging the Ore; and the Way of Dressing and of Blowing Tin: Communicated by an Inquisitive person, that was much conversant in those Mines.*

FOR the more easie apprehending of this Art, it is supposed; *First*, That there hath been a great Concussion of waters in that Separation of the waters from the waters mentioned in the Creation, *Gen. 1. v. 9. 10.* when the Dry Land first appeared; or in *Noahs* Flood; or at both times, whereby the waters moved and removed the (then) Surface of the earth.

*Secondly*, That before this Concussion, the uppermost surface of Mineral Veins or Loads did (*in most places*) lie even with the (then real, but now imaginary) surface of the Earth, which is termed by the Miners, the *Shelf*; *Fast Countrey* or Ground that was never moved in the Flood (say they;) whom and whose terms, for avoiding of superfluous words and needless circumlocutions, I shall in these following

Tab. 1.

